Paper No. 17

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte FARID Y. AOUDE, LAWRENCE D. DAVID, RENUKA S. DIVAKARUNI, SHAJI FAROOQ, LESTER W. HERRON, HAL M. LASKY, ANTHONY MASTREANI, GOVINDARAJAN NATARAJAN, SRINIVASA S.N. REDDY, VIVEK M. SURA, RAO V. VALLABHANENI and DONALD R. WALL

Appeal No. 1998-1374
Application 08/466,562[1]

ON BRIEF

Before METZ, GARRIS and PAWLIKOWSKI, Administrative Patent Judges.

METZ, Administrative Patent Judge.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134 from the

---

[1] Application for patent filed on June 6, 1995. According to the official records of the United States Patent and Trademark Office (PTO), this application is a division of Serial Number 07/758,991, filed on September 10, 1991, and now U.S. Patent Number 5,925,443, issued on July 20, 1999.

examiner's refusal to allow claims 1 through 10 and 21 through 25, all the claims remaining in the instant application.

THE INVENTION

The appealed subject matter is directed to copper-based sintering pastes for forming conductive vias and surface patterns in or on ceramic substrates. The pastes are useful in the semiconductor packaging art and control the grain size and shrinkage concomitant with the use of copper pastes on ceramic substrates. This problem has been exacerbated by the continuing trend towards high circuit densities.

Independent claims 1 and 21 are believed to be adequately representative of the appealed subject matter and are reproduced below for a more facile understanding of appellants' invention.

> Claim 1. A copper-based sintering paste for forming conductive vias and surface patterns in or on ceramic substrates, said paste comprising:
>
> powdered copper particles, powdered copper aluminate particles and organic materials,
>
> said copper aluminate constituting up to 10% by weight of said paste.
>
> Claim 21. A copper-based sintering paste for forming conductive vias and surface patterns in

or on glass-ceramic substrates, said paste comprising, by volume percent of organic solids:

90 volume percent copper particles, 5-12 volume percent glass-ceramic particles, 0.3-1.5 volume percent copper aluminate particles, and organic materials.

THE REFERENCES

The reference of record which is being relied on as evidence of obviousness is:

Nakatani et al. (Nakatani) 4,906,405 March 6, 1990

THE REJECTIONS

Claims 3 stands rejected as failing to comply with 35 U.S.C. § 112, second paragraph. Claims 1 through 10 and 21 through 25 stand rejected under 35 U.S.C. § 103 as being unpatentable from Nakatani.

OPINION

On page 2 of their main brief, appellants discuss their earlier filed application Serial Number 07/758,991, filed on September 10, 1991. This application is a division of said

earlier filed application. Appellants request at page 2 of their main brief that the appeal from the earlier application and this application be combined before the Board because the applications "claim similar subject matter, and the prior art issues are the same."

Nevertheless, the appeal in appellants' earlier filed application was decided in a decision mailed on September 28, 1998 (Paper Number 18). Therein, the Board affirmed the rejection of claims 11 through 20 under 35 U.S.C. § 103 over the disclosure of Nakatani relied on herein by the examiner to reject claims 1 through 10 and 21 through 25. In their decision in said earlier filed application, the Board "was constrained to reverse the examiner's rejection as to claims 26-30 (claim 29 stands or falls with claim 26)." See page 6 of Paper Number 18 of said earlier filed application. In response to the Board's decision, appellants canceled claims 11 through 20 and claims 26 through 30 were allowed and the application issued as U.S. Patent Number 5,925,443 on July 20, 1999.

The subject matter in the earlier filed application was directed to multilayered ceramic packages comprising a substrate and the copper-based paste herein claimed. It is

informative to reproduce here independent claims 11 and 26 from appellants' earlier filed application.

> Claim 11. A multilayered ceramic package comprising:
>
> a ceramic substrate; and a copper-based sintering paste for forming conductive vias and surface patterns in or on said ceramic substrate, said paste comprising: powdered copper particles, powdered copper aluminate particles and organic materials, said copper aluminate constituting up to 10% by weight of the paste.
>
> Claim 26. A multilayered ceramic package comprising: a glass-ceramic substrate; and a copper-based sintering paste for forming conductive vias and surface patterns in or on said glass-ceramic substrate, said paste comprising, by volume percent of inorganic solids: 90 volume percent copper particles, 5-12 volume percent of glass-ceramic particles, 0.3-1.5 volume percent of copper aluminate particles, and organic materials.

Thus, by mere inspection, it is apparent that the claims here on appeal are for the very same copper-based pastes claimed in appellants' earlier filed application as part of the "multilayered ceramic package" in independent claims 11 and 26 reproduced above.

THE REJECTION UNDER 35 U.S.C. § 112

The examiner has rejected appellants' claim 3 on the grounds that the language in claim 3 that the copper aluminate

is present "in a minimum in a small but effective amount to control shrinkage of said paste" is unclear. According to the examiner, the language is "relative, equivocal and unclear as to how much is a `small but effective amount.'" (footnote to MPEP omitted). The examiner suggests that changing the language to read "present in an effective amount to control shrinkage of said paste" would have overcome the rejection.

We are unable to discern the difference between the language of claim 3 and the proposed language suggested by the examiner. Contrary to the examiner's position, claim 3 already recites a statement of intended function coupled with the language "small but effective amount." Thus, claim 3, which further modifies claim 1, requires that the copper aluminate be present and present in an amount not less than an amount ("as a minimum") "effective to control shrinkage" of the copper-based sintering paste. We are satisfied that the language of claim 3, especially when read, as it must be, in light of appellants' disclosure beginning at page 6, line 5 through page 7, line 12, adequately describes the metes and bounds of the subject matter appellants intended to claim. Accordingly, we shall reverse the rejection of claim 3 under

35 U.S.C. § 112, second paragraph.

THE REJECTION UNDER § 103

All the appealed claims stand rejected under 35 U.S.C. § 103 as the subject matter claimed therein would have been obvious from the disclosure of Nakatani. As in the prior appeal, appellants' have presented here two sets of claims of varying scope. Claims 1 through 10 require: powdered copper particles; powdered copper aluminate particles; and, organic materials. Claims 21 through 25 require, in addition to the ingredients of claims 1 through 10, from 5-12 volume percent "glass-ceramic" particles. Except for the lack of the ceramic substrate, claims 1 through 10 here correspond substantially to claims 11 through 20 in appellants' earlier filed application. Except for the lack of the "glass-ceramic" substrate, claims 21 through 25 here correspond substantially to claims 26 through 30 in appellants' earlier filed application.

Here, although the claims in this appeal are, to some degree, broader than the claims in the prior appeal because they do not recite or require the substrate recited in the claims in the earlier filed application, the issue decided in

the prior appeal was the obviousness, in the sense of 35 U.S.C. § 103, of the copper-based paste of Claims 11 and 26. Because the copper-based paste of prior claim 11, which is identical to the copper-based paste in claim 1 before us, was determined to have been obvious from the same art now before us, we agree with the examiner that claim 1 before us would have been obvious for the reasons expressed by the prior merits panel in their opinion affirming the rejection of claims 11 through 20 as unpatentable under 35 U.S.C. § 103 over Nakatani. We incorporate herein by reference thereto the decision by the prior panel affirming the rejection of claims 11 through 20 in the prior appeal beginning with the first full paragraph on page 6 and concluding on page 8 with the paragraph bridging pages 7 and 8 of Paper Number 18.

In reaching the above conclusion, we have not overlooked appellants' argument that Nakatani is not directed to copper-pastes but to pastes where copper oxide is the main ingredient. Appellants argue that the copper present, if any, is produced *in situ* during the sintering phase and, at that point, there is no longer a paste. We disagree. In discussing the use of copper aluminate as the additive to enhance the

adhesion strength of the copper on the ceramic substrate,

Nakatani discloses at column 4, lines 32 through 47 that:

> When the copper particles and the ceramic material are to be adhered through the heat treatment in a nitrogen gas atmosphere, the presence of **CuO** or **Cu_2O** plays a great role on the adhesion. This is because the copper particles and the ceramic do not become wet in the nitrogen gas atmosphere and the adhesion reaction takes place between them only when **CuO** exists. For this reason, the conventional copper paste has adopted such a method that the copper particles have their surfaces partially oxidized, or **CuO** is added to the copper paste in advance, or the like. In this case, **CuO** or **Cu_2O** forms a **$CuAl_2O_4$** layer on an alumina substrate thereby to enhance the adhesion strength. Therefore, the use of **$CuAl_2O_4$** as the additive makes it possible to provide an adequate effect on the adhesion properties when added in a small amount. (underlining added).

Thus, Nakatani is directed to pastes comprising copper particles. Appellants' arguments concerning the amount of copper aluminate added to the pastes of claims 2 through 7 and 10 are unpersuasive. As appellants acknowledge, Nakatani describes the use of from 0.5 to 20 weight percent copper aluminate, an amount which completely includes the amounts claimed in claims 2 through 7 and 10. While appellants argue that they have demonstrated unexpected or surprising results for grain size control and shrinkage at levels of addition of less than 0.5 weight percent, the minimum amount disclosed by

Nakatani for copper aluminate, no claim is limited to amounts less than Nakatani's disclosed 0.5 weight percent minimum amount. Assuming, *arguendo*, appellants' showing is truly comparable and probative, it is by now well-settled that claims broad enough to encompass subject matter both patentable and unpatentable are unpatentable.

As for claims 21 through 25, we have recognized that these claims further require the addition of a "glass-ceramic" to the copper-based paste recited in claim 1. Appellants urge that Nakatani at best discloses the addition of a glass to their paste and that because of the different effects on the physical and electrical properties of the finished product the disclosure of the addition of glass particles to Nakatani's paste would not have rendered obvious the use of "glass-ceramic" particles. The examiner's only response to appellants' argument and the requirement in claims 21 through 25 for a "glass-ceramic" is found on pages 9 and 10 of the Answer. Therein the examiner states that Nakatani discloses the addition of alumina, a known ceramic, to the pastes disclosed therein and concludes that the addition of alumina would have rendered obvious the further inclusion of a "glass-

ceramic."

Nevertheless, claims 21 through 25 require a "glass-ceramic" not merely a ceramic. A "glass-ceramic" is a devitrified or crystallized glass and the examiner has failed to provide any evidence, as was his burden, which establishes that a ceramic and a "glass-ceramic" are the same or so similar that one suggests the other. While Nakatani does disclose the addition of glasses to their paste, glasses are, by definition, amorphous and would be expected to possess different properties than "glass-ceramics."

For all the above reasons, we shall affirm the rejection of claims 1 through 10 under 35 U.S.C. § 103 but reverse the rejection of claims 21 through 25.

SUMMARY

The rejection of claims 3 as failing to comply with 35 U.S.C. § 112, second paragraph, is reversed. The rejection of claims 1 through 10 as being unpatentable under 35 U.S.C. § 103 is affirmed. The rejection of claim 21 through 25 as being unpatentable under 35 U.S.C. § 103 is reversed.

The decision of the examiner is **AFFIRMED-IN-PART**.

No period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a)

AFFIRMED-IN-PART

ANDREW H. METZ Administrative Patent Judge	)
BRADLEY R. GARRIS Administrative Patent Judge	) BOARD OF PATENT) APPEALS AND) INTERFERENCES
BEVERLY A. PAWLIKOWSKI Administrative Patent Judge	)

AHM/gjh

Ira D. Blecker
IBM Corporation
Intellectual Property Law Dept.
Bldg. 300-482, 2070 Route 52
Hopewell Junction, NY 12533-6531